MONITORING AND OBSERVATION OF PEACH TREE LIMB PROPPERS TO ESTIMATE POTENTIAL EXPOSURE TO GUTHION^{R} AND ZOLONE^{R}: STANISLAUS COUNTY, 1985

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SUMMARY

Observation and dermal and inhalation monitoring was conducted at 17 days after second applications to evaluate potential overall exposure of peach proppers to Guthion^{R} and Zolone^{R}. Monitored activities were followed for two crews in two separate orchards for full day or half day work periods. No measurable contaminated dust was collected in the breathing zone of the workers monitored under dry and potentially dusty conditions. Low levels of the two compounds were found in hand-wash samples. The maximum total exposure for an eight hour day, which did not include whole body exposure evaluation, would equal less than 0.5 mg for either chemical even without the use of protective cotton gloves. The magnitude of hand exposures found in this investigation along with procedural observations are supportive of the expectation that small overall exposures result from this activity when conducted after the required reentry interval, especially when limited protective clothing is worn.

INTRODUCTION

In Stanislaus County, peach orchards are sprayed with phosalone (Zolone^{R}) or azinphosmethyl (Guthion^{R}) two to three times during fruit maturation to control the Oriental Fruit Moth, the Peach Twig Borer and other pests. The choice of material employed often depends on need to reenter the orchard quickly or proximity of the orchard to human activity. Traditionally, the first applications occur between the 25th of May and the 5th of June, with fruit thinning needed soon after. Second applications are made in mid- to late-June and limb supports are placed (limb propping; support boards are placed under fruit-heavy limbs to prevent breakage) as soon as the appropriate reentry interval has expired. In some years a third application is made when insect pressure is heavy and there is sufficient time for a reentry interval and the preharvest interval to expire before the harvest is begun. Treatments are carefully timed to achieve maximum control when moth flights reach their peaks.

The critical timing of pesticide applications and of the cultural requirements for peach production (thinning, limb propping, irrigation, cultivation, mowing, picking) sometimes conflict. The reentry intervals for azinphosmethyl (14 days) and phosalone (7 days) are defined by regulation, and normal cultural activities requiring reentry are prohibited by law during periods when reentry intervals are in effect (Ca. Admin. Code, Title 3, Chapter 6, Group 3, Section 6770). Therefore, this pilot study was conducted during the 1985 season to determine if a full study should be undertaken to evaluate the possibility that limb propping could be exempted from restriction during a required reentry interval.

METHODS

Orchards of two growers who had cooperated in previous studies were offered for use in this study. Cultural practices in each of the two orchards differred with regard to weed and irrigation management. The orchard of Grower 1 was irrigated by sprinkler on the orchard floor and grass was grown in the middles. By contrast, the orchard of Grower 2 was flood irrigated and the middles were weeded both mechanically and chemically resulting in a bare orchard floor. In both cases, the orchard had not recently been irrigated and the ground below the trees was fairly dry. The orchard of Grower 2 was by far the dustier environment. Reentry to perform the limb propping activity occurred 17 days after pesticide application in each orchard; only after the appropriate reentry interval had expired.

Four workers were monitored for dermal and inhalation exposure. One team of three workers was involved at each ranch which included one individual who drove the tractor which pulled the wagon carrying the limb supports and two workers that removed the boards from the wagon and wedged them under the limbs. At each ranch the workers that placed the boards were the individuals monitored. The tractor driver was observed to have minimal exposure to foliar residue, although in an orchard with closer tree spacing contact with foliage would be unavoidable. While some brushing of low limbs does occur, dermal exposure for proppers was measured only through the use of handwashes.

Clothing worn by the proppers varied by individual. Either short sleeve T-shirts were used or the worker wore a long sleeve work shirt. Pants were either denim jeans or cotton/polyester work pants. Of the four workers monitored in this study, three wore cotton gloves while the fourth was bare-handed. In each case where gloves were worn, they were previously used.

Hand-washes were collected pre- and post-work for the work periods monitored which for Grower 1 included morning and afternoon but for Grower 2 included only the morning. Hand-washes were collected using pre-prepared quantities of a five per cent water/SurTen solution which were poured into polyethylene bags. The worker was instructed to rub his hands together in the solution for thirty seconds. The handwash solution was then returned to its original jar which was sealed with the jar's lid lined with aluminum foil. The sample was immediately put on ice and held for delivery to CDFA Laboratory Services in Sacramento.

Inhalation exposure to contaminated airborn dust was measured in the workers breathing zone using pre-calibrated personal pumps drawing air through 0.8 micron Teflon filter cassettes. Cassettes were loaded and weighed prior to use. The pumps were set to draw at 0.5 Standard Liters Per Minute using a Kurz Model 540 S flow calibrator. Air flow rates were again measured at the end of the exposure period. The flow rate used in the final calculation was the mean of the beginning and ending flow rates. The filter cassettes were changed at the end of each work period and were placed on ice after collection.

Dislodgeable foliar residue samples were collected from each orchard in the area where the leaf propping activity would occur after the method of Iwata et al.(1). Leaf punches were collected on a diagonal across the orchard from random locations around the sampled trees at a height of 1.5 to 2.0 Meters using a 2.54 cm leaf punch. Fourty eight leaf discs were collected per sample. The samples were sealed with foil-lined lids and stored on ice between collection and delivery to the laboratory.

All samples collected from the orchards of Grower 1 were analyzed for azinphosmethyl and it's oxon analog only as no phosalone was used in the vicinity of the sampled orchard. In contrast, checks bordering the phosalone treated orchard of Grower 2 were treated recently with azinphosmethyl so that in addition to analysis for phosalone parent and oxon, all Grower 2 samples were also analyzed for azinphosmethyl parent and oxon. All samples were analyzed at CDFA Laboratory Services using established analytical methods.

RESULTS AND DISCUSSION

Table 1 presents the field treatment history for the orchards of Growers 1 and 2 and results of foliar dislodgeable residue samples collected in the work zones where the limb propping occurred. As reported, levels of dislodgeable residue were well below the levels calculated to be safe from acute effects in the work of Knaak, et al. (2).

Table 2 gives results of air monitoring for contaminated dust in the breathing zone of the proppers. None was detected at or above the minimum detectable levels for the parent compounds or the oxons in the samples as collected.

TABLE 1 - Characteristics of Azinphosmethyl and Phosalone Applications to Peach Orchards of Two Growers in Stanislaus County

	Grower 1		Grower 2			
	Guthion	Oxon	Phosalone	Oxon	Guthion	Oxon
Rate of Application lb AI/100 gal/Acre	1	-	2	-	Not Applied Current Season	-
Dates of Treatment	5/29/85 7/09/85	- -	5/27/85 7/01/85	- -	- -	- -
Days After Treatment Monitoring Occurred	17	-	17	-	-	-
Foliar Residue On Day of Monitoring ug/cm^2	0.77	ND[1]	2.35	ND	ND	ND
Calculated Safe Level (Parent + Oxon) ug/cm^2	1.6		7.0		1.6	

1 None detected at minimum detectable levels for foliar residue samples: Azinphosmethyl = 0.005 ug/cm^2 Azinphosmethyl Oxon, Phosalone and Phosalone Oxon = 0.01 ug/cm^2

TABLE 2 - Results of Air Sampling for Azinphosmethyl and Phosalone in the Breathing Zone of Peach Proppers

Grower:Worker	Sampling Time in Hours	Sampling Rate l/min	Sample Size liters	Azinphosmethyl mg/m^3	Phosalone mg/m^3
AM					
1:John	5.5	0.465	153.5	ND[1]	NS[2]
1:Jose	5.5	0.485	160.1	ND	NS
2:Victor	3.2	0.409	96.5	ND	ND
2:John	3.2	0.475	93.6	ND	ND
PM					
1:John	1.9	0.460	50.6	ND	NS
1:Jose	1.9	0.500	55.0	ND	NS

1 None Detected at Minimum Detectable Levels: Parent Compounds 0.2 PPB
2 No Sample Collected
3 No Oxon Analogs Found

TABLE 3 - Measured Hand Exposure for Identified Work Periods; Three Out of Four Individuals Wore Cloth Work Gloves

Grower: Worker	Sample Time Hours	Sample Volume ml	Azinphosmethyl Detected ug	Phosalone Detected ug
Post-AM				
1: John Gloves	5.5	260	7.3	-
1: Jose Gloves	5.5	255	9.4	-
2: Victor Gloves	3.2	324	6.0	27.0
2: John No Gloves	3.2	320	24.0	172.0
Post-Lunch				
1: John Gloves	0.5	270	0.9	-
1: Jose Gloves	0.5	274	4.4	-
Post-Work				
1: John Gloves	1.9	260	3.6	-
1: Jose Gloves	1.9	270	5.8	-

No parent or oxon was found in pre-work handwashes
No oxon analog was found for either compound
Minimum detectable levels were 0.5 ug /sample for parents and 5.0 ug for oxon analogs

TABLE 4 - Cumulative Exposures for Work Periods Monitored and Results as Extrapolated to an Eight Hour Day Representing Hand and Inhalation Exposure Only

Grower:Worker	Total Azinphos. ug	Total Phosalone ug	Time hours	Estimated Azinphos. ug/8 hr	Estimated Phosalone ug/8 hr
1: John Gloves	11.8	-	7.9	12	-
1: Jose Gloves	19.6	-	7.9	20	-
2: Victor Gloves	6.0	27.0	3.2	15	70
2: John No Gloves	24.0	172.0	3.2	60	430

Totals include handwash measurements after lunch for the workers of Grower 1

Table 3 presents hand-wash data for individual workers by work period. It is not clear where the azinphosmethyl residue found in the handwash samples for the proppers of Grower 2 came from as no azinphosmethyl residue was found in the leaf dislodgeable residue samples for that orchard. While one possible source is the used gloves that were worn by one worker, this does not explain the small amount of residue found on the hands of the second worker. It may be possible that some residue remains on the propping boards themselves from the previous year. Hand-wash results indicate a four to six-fold protection factor from wearing cotton work gloves.

Table 4 summarizes exposure for each worker by chemical and extrapolates the amount of compound found in the handwashes to what might be expected for an eight hour day if exposure were to remain constant. The maximum for either compound was less than 0.5 mg per eight hour period. This does not include potential dermal exposure other than the hands. The handwash samples were the only personal samples returned from the laboratory with measurable quantities of the compounds of concern.

Whole body dermal exposure remains unmeasured. As body and clothing contact with foliage is substantially less than that which might be expected for a harvester, current transfer coefficients could not be used correctly here. Observation indicates that the limited body exposure that could occur, would be found primarily in the head, the upper trunk and the arms. The magnitude of hand exposure would support the expectation that whole body dermal exposure would also be low.

This activity appears to involve small crews but is a wide-spread practice amoung peach growers. As the crews are small, the number of days of exposure per crew would be considerable. The speed with which the work is done would be expected to range from one to three acres per hour.

Additional efforts in monitoring the practice need to be weighed against the value of reducing the reentry interval and the cost of the monitoring. It is likely that a complete monitoring study conducted prior to the expiration of the appropriate reentry interval would show an acceptable level of exposure that would not be expected to result in significant cholinesterase inhibition, but a short reentry restriction would probably still be necessary.

REFERENCES

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